

What is claimed:

1. A method of controlling rendering by a device comprising:

a) providing at least a half duplex or better bi-directional communications path between a client and a rendering device; said device including resources for storing data and rendering an image based on data sent to the device by the client through the bi-directional communications path; and

b) co-ordinating rendering by the device by:

i) sending a initial request for services relating to a job to said device that indicates characteristics of said job;

ii) acknowledging the initial request and requesting rendering data to be sent; and

iii) in response to the request for rendering data, sending rendering data and awaiting additional requests for more data or in the event all data of a job has been sent to the rendering device awaiting an indication that rendering of said job has been completed.

2. The method of claim 1 wherein the characteristics sent with the initial request includes an amount of data for the job.

3. The method of claim 1 wherein the initial request indicates that an amount of data in the job is not known.

4. The method of claim 1 and wherein the data sent to the device includes a data unavailable indicator which indicates to the device data for said job is presently not available and further including a timeout during which the device suspends processing of said job until the data becomes available.

5. The method of claim 1 wherein the client sends data to the rendering device when said data is made available to said client and wherein the rendering device awaits receipt of more data or an end of data indicator.

6. The method of claim 1 wherein the device discards data already sent to the device to accommodate additional data from the print client.

7. The method of claim 6 wherein the device makes a request for retransmission
5 of data that was previously discarded during rendering of the job for subsequent use in rendering.

8. The method of claim 1 wherein the rendering device is a printer and the data is organized into pages by the client and wherein the requests for data sent by the printer to
10 the client fulfills the needs for printing one or more pages.

9. The method of claim 8 wherein the initial request includes an amount of data in the job and wherein in the event the printer determines from the initial request sent by the client that it has enough resources to handle an entire document, the printer requests a
15 transfer data for printing an entire document.

10. The method of claim 1 wherein the rendering device is a printer and said printer comprises a memory which stores document resources or a part of a document resource and wherein the printer maintains a hit cache and deletes resources from the
20 cache when that have not been recently used when new resources are added to the cache.

11. The method of claim 10 wherein the printer first checks the cache when it needs to issue a request for a resource.

25 12. The method of claim 1 wherein asking for rendering data in response to the initial request is performed either substantially immediately or after a delay due to utilization of resources for rendering of data from other clients.

13 A process for controlling printing of a print job by a printer comprising:
30 sending a print job request from a client to the printer, said request comprising: a unique source identifier for the job; a type of document or documents that make up the

print job; an source address where a plurality of document resources can be retrieved; printer settings to apply to the document or documents; metadata concerning the document or documents; and a printer timeout;

5 replying to the request with an initial response that indicates if the document print request can be accepted and if it is accepted, supplying a printer identifier for the print job on the printer for use by the client to subsequently identify the print job on the printer;

10 submitting a data request for document data at the source address; said data request identifying a resource in the document to retrieve, and an amount of resource data to retrieve;

transmitting the requested document data to the printer; and
processesing the data at the printer and based on the contents of the document data issuing an additional request to the client for additional document data.

15 14. The process of claim 13 wherein the metadata includes a size and type of the document or documents.

20 15. The process of claim 13 wherein the data request includes an offset into a collection of resource data.

16. The process of claim 15 wherein the collection of resource data is a glyph or a range of glyphs.

25 17. The process of claim 13 wherein the resource contains a picture or a font and wherein the printer issues a new request to retrieve the data for the font or picture.

18. The process of claim 13 wherein the printer formats a page at a time and after each page the printer issues a request to retrieve data for the next page.

30 19 The process of claim 13 wherein request for print resources are repeated until an entire job has been printed.

20. The process of claim 13 wherein the printer sends the client a message that indicates that the job has been completed.

5 21. The process of claim 13 wherein the print job request indicates a streaming mode wherein data is sent from the client to the printer as it becomes available to the client once the printer has accepted the print job.

10 22. The process of claim 13 wherein the initial request indicates that an amount of data in the job is not known.

15 23. The process of claim 13 and wherein the data sent to the printer includes a data unavailable indicator which indicates to the printer data for said job is presently not available and further including a timeout during which the device suspends processing of said job until the data becomes available.

20 24. The method of claim 13 wherein the client sends data to the printer when said data is made available to said client and wherein the printer awaits receipt of more data or an end of data indicator.

25 25. A system for printing documents comprising:

a) a client for formatting print data into pages for transmission;

b) a printer for receipt of the print data from the client and for rendering an image based on the print data;

25 c) a communication channel for providing at least half duplex or better bi-directional communications path between a client and the printer; said printer including print resources for storing print data and rendering an image based on data sent to the printer by the client through the bi-directional communications path; and

30 d) components included in the printer or the client for co-ordinating image rendering by the printer by:

i) sending a initial request for services relating to a job to said printer that indicates characteristics of said job;

ii) acknowledging the initial request and requesting print data to be sent;
and

5 iii) in response to the request for print data, sending print data and awaiting additional requests for more data or in the event all data of a job has been sent to the printer awaiting an indication that printing of said job has been completed.

10

26. The system of claim 25 wherein the printer comprises a page memory for storing a page of data and further comprises a print head in communications with the page memory for rendering an image based on the contents of the page memory.

15

27. The system of claim 25 wherein the printer includes resources for storing print data to avoid repeated requests for print data from the print client.

28. The system of claim 25 wherein the printer comprises a memory which caches document resources or a part of a document resource and wherein the printer
20 includes a computation device that maintains a hit cache and deletes resources from the cache when that have not been recently used when new resources are added to the cache.

25

29. The system of claim 28 wherein computation device of the printer first checks the cache when it needs to issue a request for a resource.

30. Apparatus for controlling rendering by a device comprising:
a) means for providing at least half duplex or better bi-directional communications path between a client and a device; said device including resources for storing data and rendering an image based on data sent to the device by the client through
30 the bi-directional communications path; and

b) means for co-ordinating rendering by the device by:

i) sending a initial request for services relating to a job to said device that indicates characteristics of said job;

ii) acknowledging the initial request and requesting rendering data to be sent; and

5 iii) in response to the request for rendering data, sending rendering data and awaiting additional requests for more data or in the event all data of a job has been sent to the rendering device awaiting an indication that rendering of said job has been completed.

10 31. A computer readable medium containing instructions for controlling printing by a printer comprising:

a) implementing a half duplex or better bi-directional communications connection between a client and a printer that includes resources for storing data and rendering an image based on data sent to the printer by the client through the bi-directional

15 communications path; and

b) co-ordinating printing by the printer by:

i) sending a initial request for services relating to a job to said printer that indicates characteristics of a print job;

20 ii) acknowledging the initial request and requesting rendering data to be sent; and

25 iii) in response to the request for rendering data, sending rendering data and awaiting additional requests for more data or in the event all data of a print job has been sent to the printer awaiting an indication that rendering of said print job has been completed.